Small Business Innovation Research/Small Business Tech Transfer

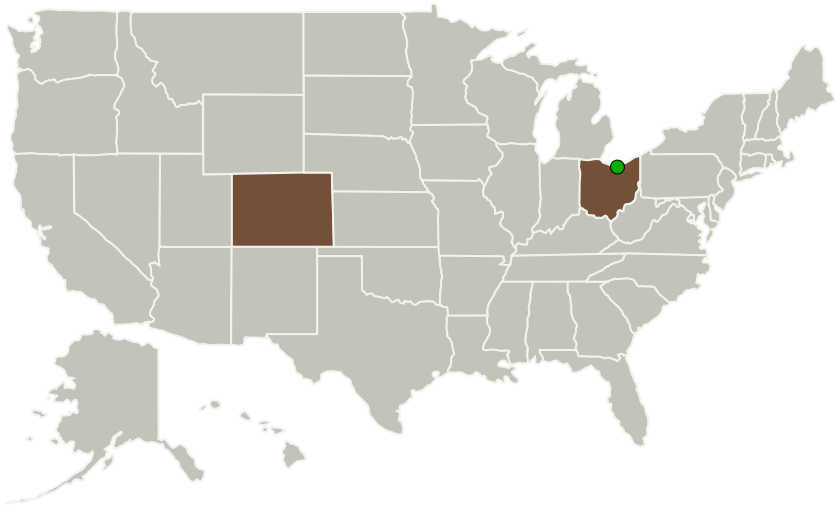
Microsatellite Direct Drive SEP Module for Interplanetary Exploration via Rideshare, Phase I

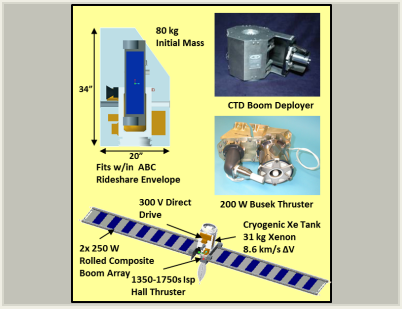
Completed Technology Project (2013 - 2013)

Project Introduction

Solar Electric Propulsion drives down the cost of space missions by using its high propulsion efficiency to step down from one launch class to another. As launch costs can be up to a third of total mission costs, stepping down to a smaller rocket can be a mission enabling technology in today's budget constrained environment. While missions such as Dawn have used this to visit multiple asteroids after launch from a small launch vehicle, ExoTerra's SolRider Direct Drive (DD) SEP module allows interplanetary missions to take the next step down in launch cost to package within standard rideshare envelope and mass contraints. Our module integrates multiple technologies to provide up to 8.6 km/s within an Atlas Aft Bulkhead Carrier rideshare or 14.6 km/s of delta-V within a standard ESPA. This can enable launch costs below $5M. Our integrated DD SEP module uses a combination of SEP technologies to create a highly efficient system to package within the rideshare envelope. We use a 175 W/kg and 60kW/m3 rolled composite tube solar array deployment system to package within the tight volume. This provides 300 V power to the thruster through a direct drive system, eliminating the cost, mass and electrical losses of the traditional power processing unit. A Hall Thruster uses the high voltage power to efficiently propel the craft with over 1600 s of Isp. The thruster receives the propellant from a cryogenic Xenon feed system, allowing an order of magnitude drop in tank mass. When coupled to Microsatellite electronics, the system can deliver up to 5.5 kg of payload instruments to Mars orbit.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
ExoTerra Resource, LLC	Lead Organization	Industry	Littleton, Colorado
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138303)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ExoTerra Resource, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

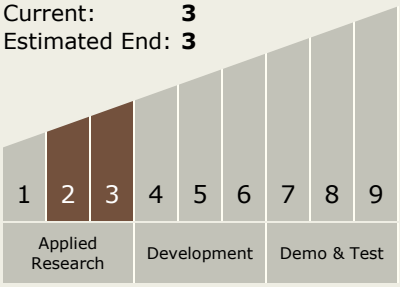
Carlos Torrez

Principal Investigator:

Paul Wilbur

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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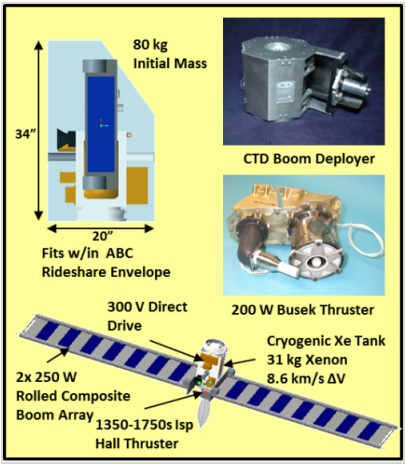
Images



Project Image
Microsatellite Direct Drive SEP Module for Interplanetary Exploration via Rideshare
(https://techport.nasa.gov/image/134444)

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System